

CLAIMS**WHAT IS CLAIMED IS:**

1. A method of controlling a blood pump, comprising:
analyzing an instantaneous flow waveform in both the time domain and frequency
5 domain; and
controlling the pump in response thereto.
2. A method of controlling a blood pump, comprising:
analyzing instantaneous and mean values of pump power or pump current;
10 analyzing pump flow; and
determining a pump speed in response thereto.
3. A method of controlling a blood pump, comprising:
calculating and maintaining a desired flow rate based on an interpolation of a desired
15 flow rate at rest heart rate and a desired flow rate at exercise heart rate.
4. The method of claim 3, where the heart rate is determined from a frequency
domain analysis of the flow waveform.
- 20 5. The method of claim 3, where the heart rate is determined from a time domain
analysis of the flow waveform.
6. The method of claim 1, in which the analysis of the flow wave form determines a
suction boundary condition.

7. A method of controlling a blood pump, the control method having a constant speed, a constant flow, a constant peak-to-peak amplitude, and a maximal control mode.

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8. The method of Claim 6, further comprising boundary conditions for maximum power, maximum speed, minimum speed, minimum flow, change in flow peak-to-peak amplitude over change in pump speed, change in mean flow over change in pump speed, and change in pump power over change in pump speed.

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9. A method of controlling a blood pump which allows selectable levels of unloading with higher levels of unloading presenting a greater risk of running the pump closer to suction.

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10. The method of claim 6 or claim 8 where the boundary conditions become control parameters for closed loop control.

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11. The method of claim 6 or claim 8 where the boundary conditions cause the control system to clamp pump speed, and where upper boundary conditions do not allow the speed to be increased further while lower boundary conditions do not allow the speed to be decreased further.

12. The method of claim 6 or claim 8 where the boundary condition of suction causes a predetermined decrease in speed then periodically attempts to return to the desired control mode at predetermined intervals.
- 5 13. A method of controlling a blood pump which maintains or maximizes the ratio of diastolic flow to mean flow.
14. A method of controlling a blood pump which maintains or maximizes the ratio of peak diastolic flow to mean flow.
- 10 15. The method of Claim 7 where the maximize control mode can be patient enabled via an exercise button.
16. The method of claim 1,2,3,7 or 9 where a fail-safe feature to switch to the Constant Speed mode is automatically enabled in the event of a lost, erroneous, or compromised flow signal.
- 15 17. The method of claim 1 where the quality of the flow signal is determined by the frequency domain analysis of the real-time flow waveform.
- 20 18. A method of controlling a blood pump, comprising adapting to a patient's individual physiology in response to suction detection events, repeated attempts at achieving a desired dQ/dn or repeated attempts at dW/dn .

19. A method of controlling a blood pump, comprising adapting to a patient's individual physiology in response to speed variations, by adapting the desired peak-to-peak flow amplitude to changes of flow and power at repeated variations of speed.